

CLAIMS

What is claimed is:

1. A dielectric substrate useful for wrapping wire or cable or for supporting electronic circuitry, the substrate comprising:

- 5 a. a polyimide layer having a thickness in a range between and including any two of the following thicknesses: 8, 10, 12, 15, 20, 25, 30, 40, 50, 60, 70, 75, 80, 90, 95, 100, 120, 125, 130, 135, 140, 145 and 150 microns; and,
- b. a high-temperature bonding layer having:
 - 10 i. a thickness between and including any two of the following numbers: 0.25, 0.5, 0.75, 1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 25 microns;
 - ii. a melting point in a range between and including any two of the following temperatures: 220, 225, 230,
 - 15 240, 250, 260, 270, 280, 290, 295, 300, 305, 310, 315 and 320°C; and
 - iii. the high-temperature bonding layer comprising a high temperature base polymer comprising poly(tetrafluoroethylene-co-perfluoro[alkyl vinyl
 - 20 ether]) (PFA) in a concentration range between and including any two of the following weight percentages (based upon the total amount of PTF base polymer): 40, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 96, 97, 98, 99 and 100; and optionally blended with
 - 25 poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP) in an amount in a range between (and including) any two of the following weight percentages (based upon total weight of PTF base polymer): 0, 1, 2, 3, 4, 5, 10, 15, 20, 25, 30, 35, 40,
 - 30 45, 50, 55 and 60.

2. A dielectric substrate in accordance with Claim 1 further comprising an exterior layer of polytetrafluoroethylene (PTFE) having a thickness in a range between and including any two of the following: 1, 2, 5, 7, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100, 150, and 200 microns and

35 wherein the exterior layer is adjacent to the high-temperature bonding layer.

3. A dielectric substrate in accordance with Claim 2 wherein the exterior layer is partially or wholly sintered.

4. A dielectric substrate in accordance with Claim 1 further comprising a polyimide-to-metal ("PTM") bonding layer adjacent to the polyimide layer on an opposite side of the high-temperature bonding layer, the PTM bonding layer having a PTM base polymer comprising about 50,
5 60, 70, 80, 90, 95, 96, 97, 98, 99, 99.5 or 100 weight percent poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP), optionally blended with a second copolymer selected from the group consisting of: polytetrafluoroethylene (PTFE), poly(tetrafluoroethylene-co-perfluoro[alkyl vinyl ether]) (PFA); poly(ethylene-co-tetrafluoroethylene) (ETFE) and
10 derivations or copolymers thereof, wherein the PTM bonding layer has a thickness between and including any two of the following: 0.25, 0.3, 0.4, 0.5, 0.75, 1, 2, 3, 4, 5, 10, 15, 20, 22 or 25 microns.

5. A dielectric substrate in accordance with Claim 2 further comprising a polyimide-to-metal ("PTM") bonding layer adjacent to the
15 polyimide layer on an opposite side of the high-temperature bonding layer, the PTM bonding layer having a PTM base polymer comprising about 50, 60, 70, 80, 90, 95, 96, 97, 98, 99, 99.5 or 100 weight percent poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP), optionally blended with a second copolymer selected from the group consisting of:
20 polytetrafluoroethylene (PTFE), poly(tetrafluoroethylene-co-perfluoro[alkyl vinyl ether]) (PFA); poly(ethylene-co-tetrafluoroethylene) (ETFE) and derivations or copolymers thereof, wherein the PTM bonding layer has a thickness between and including any two of the following: 0.25, 0.3, 0.4, 0.5, 0.75, 1, 2, 3, 4, 5, 10, 15, 20, 22 or 25 microns.

25 6. A dielectric substrate in accordance with Claim 1 further comprising an adhesive primer layer in contact with and positioned between the polyimide core layer and the high-temperature bonding layer, the adhesive primer layer having an adhesive primer base polymer comprising about 50, 60, 70, 80, 90, 95, 96, 97, 98, 99, 99.5 or 100 weight
30 percent poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP), optionally blended with a second copolymer selected from the group consisting of: polytetrafluoroethylene (PTFE), poly(tetrafluoroethylene-co-perfluoro[alkyl vinyl ether]) (PFA); poly(ethylene-co-tetrafluoroethylene) (ETFE) and derivations or copolymers thereof, and wherein the PTM bonding layer has
35 a thickness between and including any two of the following: 0.25, 0.3, 0.4, 0.5, 0.75, 1, 2, 3, 4, 5, 10, 15, 20, 22 or 25 microns.

7. A dielectric substrate in accordance with Claim 2 further comprising an adhesive primer layer in contact with and positioned

between the polyimide core layer and the high-temperature bonding layer, the adhesive primer layer having an adhesive primer base polymer comprising about 50, 60, 70, 80, 90, 95, 96, 97, 98,99, 99.5 or 100 weight percent poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP), optionally
5 blended with a second copolymer selected from the group consisting of: polytetrafluoroethylene (PTFE), poly(tetrafluoroethylene-co-perfluoro[alkyl vinyl ether]) (PFA); poly(ethylene-co-tetrafluoroethylene) (ETFE) and derivations or copolymers thereof, and wherein the PTM bonding layer has a thickness between and including any two of the following: 0.25, 0.3, 0.4,
10 0.5, 0.75, 1, 2, 3, 4, 5, 10, 15, 20, 22 or 25 microns.

8. A dielectric substrate in accordance with Claim 4 further comprising an adhesive primer layer in contact with and positioned between the polyimide core layer and the high-temperature bonding layer, the adhesive primer layer having an adhesive primer base polymer
15 comprising about 50, 60, 70, 80, 90, 95, 96, 97, 98,99, 99.5 or 100 weight percent poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP), optionally blended with a second copolymer selected from the group consisting of: polytetrafluoroethylene (PTFE), poly(tetrafluoroethylene-co-perfluoro[alkyl vinyl ether]) (PFA); poly(ethylene-co-tetrafluoroethylene) (ETFE) and
20 derivations or copolymers thereof, and wherein the PTM bonding layer has a thickness between and including any two of the following: 0.25, 0.3, 0.4, 0.5, 0.75, 1, 2, 3, 4, 5, 10, 15, 20, 22 or 25 microns.

9. A dielectric substrate in accordance with Claim 4, wherein the polyimide-to-metal (PTM) base polymer consists essentially of
25 poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP).

10. A dielectric substrate in accordance with Claim 5, wherein the adhesive primer base polymer consists essentially of
poly(tetrafluoroethylene-co-hexafluoropropylene) (FEP).

11. A dielectric substrate in accordance with Claim 1 being further
30 defined as a wrap for an electrical wire or cable to provide continuous, heat-sealable, electrical insulation.

12. A dielectric substrate in accordance with Claim 2 being further defined as a wrap for an electrical wire or cable to provide continuous, heat-sealable, electrical insulation.

35 13. A dielectric substrate in accordance with Claim 3 being further defined as a wrap for an electrical wire or cable to provide continuous, heat-sealable, electrical insulation.

14. A dielectric substrate in accordance with Claim 4 being further defined as a wrap for an electrical wire or cable to provide continuous, heat-sealable, electrical insulation.

5 15. A dielectric substrate in accordance with Claim 5 being further defined as a wrap for an electrical wire or cable to provide continuous, heat-sealable, electrical insulation.

16. A dielectric substrate in accordance with Claim 1 being further defined as a support for an electronic circuit.

10 17. A dielectric substrate in accordance with Claim 2 being further defined as a support for an electronic circuit.

18. A dielectric substrate in accordance with Claim 4 being further defined as a support for an electronic circuit.

19. A dielectric substrate in accordance with Claim 5 being further defined as a support for an electronic circuit.

15 20. A dielectric substrate in accordance with Claim 4 wherein the high-temperature bonding layer and the adjacent adhesive primer layer have a bond strength greater than or equal to 2, 3, 4, 5, 6, 7, 8, 9, or 10 pounds per linear inch.

20 21. An electrically insulated wire or cable wherein the dielectric substrate of Claim 1 is the form of an electrically insulative tape, wherein the tape is wrapped around the wire or cable.

22. An electrically insulated wire or cable wherein the dielectric substrate of Claim 1 is in a form of an electrically insulative tape and wherein the tape is wrapped around the wire or cable.

25 23. An electrically insulated wire or cable wherein the dielectric substrate of Claim 4 is in a form of an electrically insulative tape and wherein the tape is wrapped around the wire or cable.

30 24. An electrically insulated wire or cable wherein the dielectric substrate of Claim 5 is in a form of an electrically insulative tape and wherein the tape is wrapped around the wire or cable.

25. An electrically insulated wire or cable of Claim 2 wherein the substrate is in the form of an electrically insulative tape, wherein the tape is wrapped around the wire or cable in an overlapped fashion by at least 50 to 100 percent.

35 26. A substrate in accordance with Claim 1 wherein the polyimide layer further comprises a material selected from the group consisting of carbonates that evolve carbon dioxide, minerals containing water of

hydration, and polymers that decompose without producing carbonaceous or other conductive by-products on decomposition.